Eelgrass Restoration Project Update 11-30-05

The 2005 field season ended with the planting of about 14,400 eelgrass shoots and 300,000 seeds at 3 locations in August and September. This brought the total number of shoots planted during 2005 to about 21,000. We tried a new planting technique we developed using a lighter, modified version of the TERF™, and also harvested and planted seeds. Volunteers remained a mainstay of our planting and harvesting days.

Selected sites

All four 2nd-stage test transplant sites (see July 8 update) fared well over summer 2005. Three were selected for larger-scale plantings in late summer/fall 2005 (Figure 1), and the fourth will likely be planted in spring 2006. We planted 3600 shoots at Peddocks Island, 3600 at Weymouth, and 7200 shoots at Long Island.

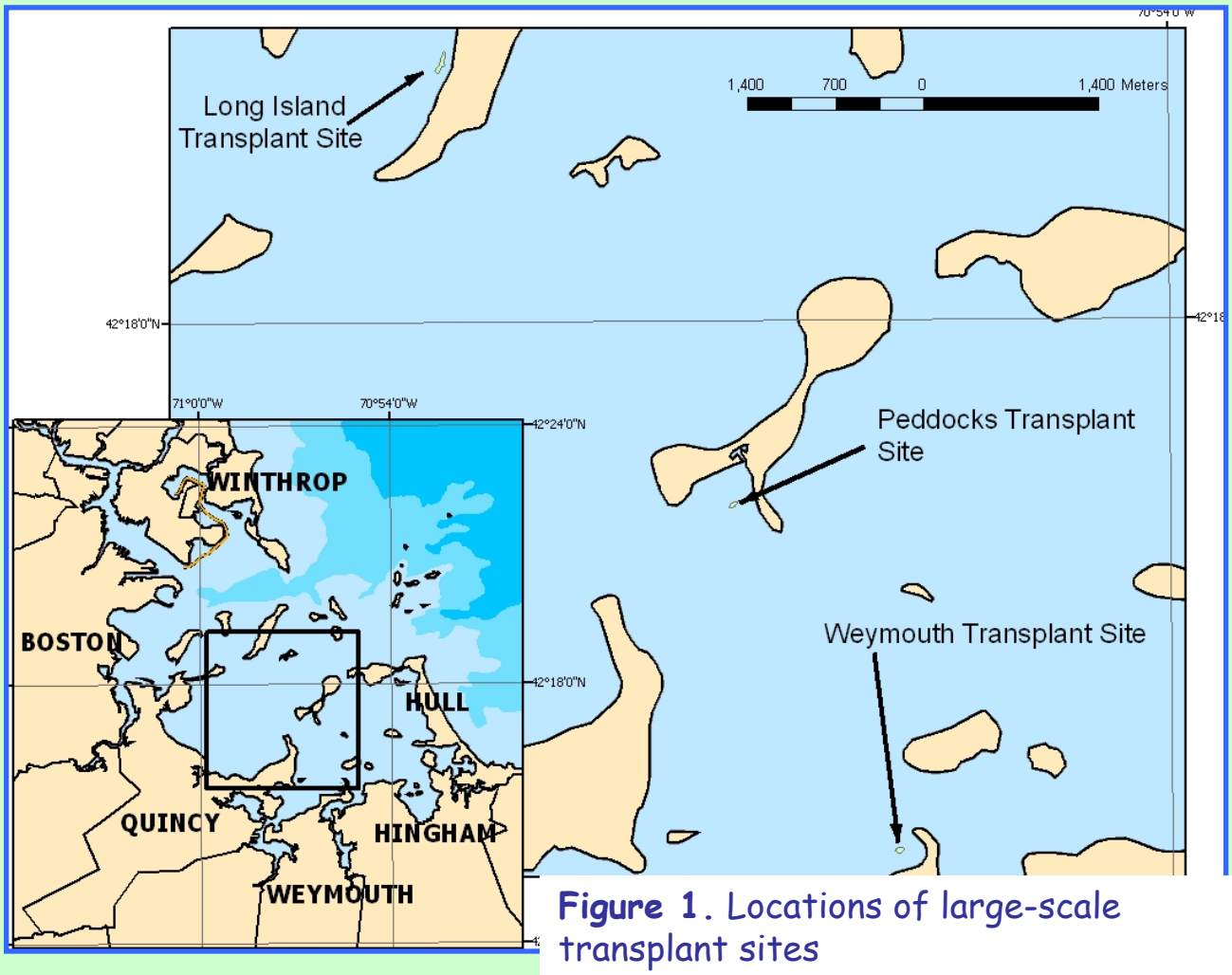
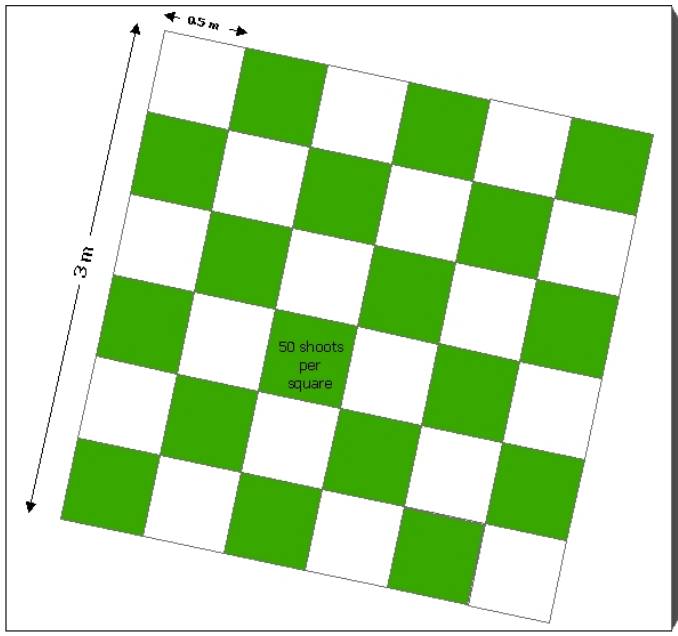


Figure 1. Locations of large-scale transplant sites

A checkerboard pattern was used at all sites: we alternated 18 planted ¼ m^2 quadrats with 18 unplanted quadrats (Figure 2). This pattern, adapted from a restoration technique used by Save the Bay, Rhode Island, is designed to cover more ground than continuous planting of shoots, while providing voids for eelgrass to fill in. The Long Island site contains 8 of these grids, 4 each along two 150 m transects, bounding approximately one acre. The other two sites contain 4 grids each, and encompass a little under half an acre per site. If these sites are successful, we will enlarge these plantings next year. Additional test transplants will also be made at the original Long and Peddocks Island sites.



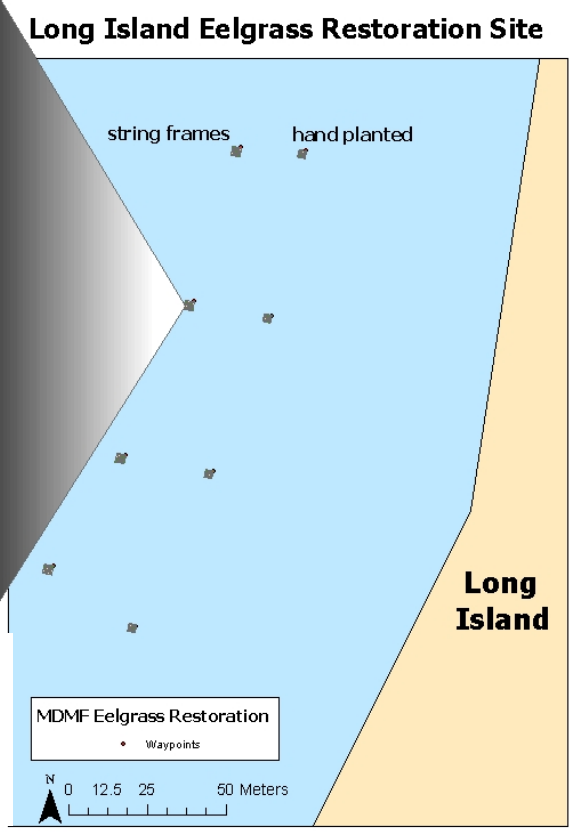


Figure 2. Checkerboard planting pattern for larger-scale transplants. Green represents planted quadrats and white are unplanted.

Harvest

Shoots were harvested from donor beds off Nahant. We monitor these beds to determine whether our harvesting activities detrimentally affect the eelgrass. Shoot counts are taken approximately every two months along harvested transects and control transects in the same area. To date, there has been no significant difference in the counts.

Transplants

We developed a lighter and lower profile alternative to the wire mesh TERF™, making it easier to handle. It is a ¼ m square, 3/4 " PVC pipe frame holding stretched jute (landscape) mesh to which shoots are tied. Upon deployment and rooting of attached shoots, the jute can be easily cut from the inside of the frame, leaving it to biodegrade while the frames are retrieved for reuse. We used only PVC frames at the Weymouth site, where hand-planting would reduce visibility by stirring up soft sediment. In contrast, only hand planting was used at Peddocks Island, where gravel prevents frames from lying flat against the bottom. Both methods were used at Long Island where the sediment is sandy.

Figure 3. Volunteers building PVC/jute frames (upper left), tying eelgrass shoots to PVC frames (right) and hand-planting eelgrass (lower left).

We received a lot of volunteer help during harvesting and planting from the National Park Service, the BEAN program (Boston Environmental Ambassadors to National Parks), Single Volunteers of Boston, Norfolk County House of Corrections, New England Aquarium, Aimco Real Estate community service program, Save the Bay Rhode Island, and ordinary citizens. Seventeen volunteer divers and 95 shore helpers put in 305 man-hours of work and contributed enormously to the success of the program.

Seeds

We harvested flowering shoots from Nahant in July and kept them in a flow-through seawater tank at the Marine Biological Laboratory in Woods Hole until they ripened and dropped from the leaves (Figure 4). We then collected and sorted the seeds by extensive sieving. Seeds were stored in smaller tanks until we were ready to plant them.

Figure 4. Clockwise from above left: flowering shoots in the water and after harvesting, sieving out leaves, and cleaned seeds.

We planted about 270,000 seeds at 2 sites in different densities to test the effect of density on germination or survival. The remaining 22,000 were broadcasted at a different site to allow us to evaluate this simpler method.

Monitoring

General health of planted eelgrass was assessed at each site, including counting shoots to determine survival. Survival was reasonably high, and new growth was observed at sites planted in August. Any shoot loss at these sites was primarily due to inadequate anchoring of the rhizomes rather than an unsuitable environment. We will continue to work on ways to better anchor the shoots until they can root. The PVC frames appear to be working very well. Roots tied to the frames have been silted over and the jute is mostly buried (Figure 5). We will retrieve these frames in the spring.

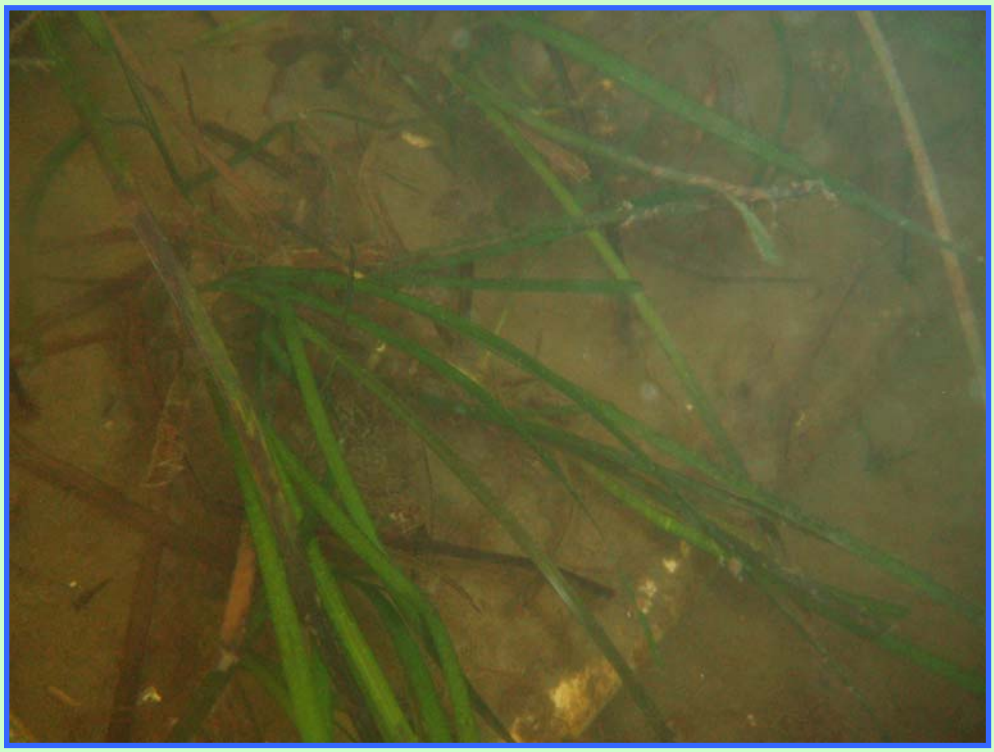


Figure 5. Eelgrass transplanted in PVC frames. Note that jute mesh is silted over and shoots are firmly in place.

In contrast, we may abandon the Weymouth site. Shoots there appear unhealthy, possibly the result of unsuitable sediment and light attenuation caused by silt resuspension. Test transplants at this site looked acceptable and did not experience a die-off until late summer. These results are disappointing because we were anxious to have a site along the mainland, since all other sites are accessible only by boat. At this point, however, we have largely eliminated the Boston Harbor mainland perimeter due to its poor potential for supporting eelgrass. This is primarily due to the presence of black, anoxic sediment and/or fine-grained silty sediment, which likely resulted from extensive pre-outfall organic loading. In general, the sediment surrounding some of the islands is more promising.

Future plans

During the off-season of winter 2006 we will further investigate the feasibility of co-planting shellfish with eelgrass (Figure 6). Shellfish feed by filtering particles from the water and in large numbers can have a significant positive impact on water clarity in a localized area. Improved light penetration favors eelgrass survival and growth.

Figure 6. View of a mussel bed. This species exhibits a high water filtration rate.

Monitoring of our planted sites will resume next field season to catalog survival. Comparisons of planted sites (e.g., buoyed Figure 7) to control sites will be initiated to evaluate species abundance and diversity.

Figure 7. A buoy marks a planted site off Long Island. The Long Island Bridge is in the background.